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COST OF PRODUCING CROPS IN NORTHWESTERN OHIO

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CONTENTS

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COST OF PRODUCING CROPS IN NORTHWESTERN OHIO

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SUMMARY

A 1959 study of crop expenses for 60 northwestern Ohio farms that ranged in size from 165 to 275 acres and averaged 220 showed the following costs per acre: corn, about $58; soybeans, $46; oats, $42 and wheat, $47. The average cost of producing an acre of hay on 73 farms ranging in size from 100 to 560 acres and averaging 230 was as follows: one cutting, $37; two cuttings, $50; and three cuttings, $57.

These costs for producing grain and hay include a land charge of $18 an acre and a payment of $1.50 an hour for all labor used. Some farmers had crop costs that were lower than the above figures while others had costs that were higher.

Costs of producing an acre of corn, soybeans and small grain declined as size of farm increased. However, most of this cost reduction occurred before size of farm reached 300 crop acres because size of machines and intensity of use did not increase much on farms above this acreage. An increase in rotated crops from 110 to 440 acres reduced the cost of producing an acre of corn and soybeans about $7 and an acre of oats $3.50. About two-thirds of these reductions in cost were due to lower tractor and machinery charges and the remaining one-third resulted from using less labor.

Labor costs for corn, soybeans, oats and wheat declined substantially as size of farm increased because larger tractors and machinery reduced the amount of time required to perform a specific job. Tractor costs declined as size of farm increased because of more intensive use and larger size tractors. Machinery costs declined as size of farm increased because of a more intensive use of equipment.

On many farms, corn pickers and combines account for more than one-half of the total machinery charges for corn, soybeans and small grain. However, operators of small farms can compete with operators of large tracts of land on a unit cost basis if they (1) hire crops harvested; (2) own harvesting equipment and do enough custom work on other farms to use the machine 100 or more hours a year; or (3) purchase second-hand harvesting equipment when a new machine would become obsolete before it wears out.

Profits from an acre of the various crops grown on a 220-acre farm were as follows: corn, $16 for a 75 bushel yield; soybeans, $14 for a 30 bushel yield; wheat, $9 for a 32 bushel yield; two cuttings of hay, $4 for a 2.7 ton yield; and three cuttings of hay, $7 for a 3.2 ton yield. These profits were left after paying all costs including charges for labor and the use of the land. This same method of figuring showed a loss of $3 for each acre of oats produced and a $5 loss for an acre of hay when only one cutting was made and no pasturing was done the remainder of the season.

A good crop farmer usually has high crop costs on an acre basis because of heavy expenditures for fertilizer, manure and lime. However, if he produces high yields, he will have low costs per bushel of grain or ton of hay produced. He also will have high profits per acre.

The amount of time used to perform the various jobs needed to produce crops varied considerably because of differences in the rate of travel at which machines were operated, frequency of equipment breakdowns, amount of time needed to move machines to and from fields, weather, yields and size of fields.

OBJECTIVES

The main objectives of this study were as follows:

1. To determine the amount of man labor, tractor power, machine time, fertilizer, lime, seed and spray material used by farmers to raise and harvest an acre of corn, soybeans, oats, wheat and hay on different size farms in northwestern Ohio.
2. To determine the cost of producing an acre of the various farm crops.
3. To determine how size of farm affects crop costs and profits per acre.
4. To determine the amount of time required to produce farm crops when different size tractors and equipment are used.

How Study Was Made

The following data were collected on 153 farms in

[1]Assistance was given by J. H. Sitterley and others of the Department of Agricultural Economics and Rural Sociology. Most of the field work was done by Walter Hunnicutt.

Paulding, Van Wert, Henry, Putman, Wood and Sandusky counties for the 1959 crop season; land use, crop yields and amount of labor, power, equipment, fertilizer, manure, lime, seed and spray used. Most of the crop cost information was obtained from record books kept by farmers. However, some data were obtained by personal interviews at the time the record books were collected for analysis.

Since this study was confined to the old lakebed soils of northwestern Ohio, the first step was to delineate the areas having the desired soil types. The second step was to contact county agricultural agents, vocational agriculture instructors and soil conservationists in these areas for a list of farmers who might keep the following records as the crop work was done: acres of land covered, number of man and tractor hours used, number of men in the crew and size of tractor and machine used for the specific operation. The third step was to contact this list of farmers, individually or in groups, to determine who would actually participate in the study. At this time, each farmer who agreed to cooperate in the project was given detailed instructions for keeping the necessary records. The fourth step was to collect the record books and obtain some additional information after all crops were harvested. To keep the costs of collecting data to the minimum, no visits were made to any of the cooperators between the time the record books were distributed and the time they were collected. One hundred eighty-nine farmers agreed to keep the necessary records; 153 finished the task. Although this sampling procedure permits a possible bias in favor of record keepers, this possible bias was accepted because of the need for accurate and complete labor, power and machinery records. Some of the farmers did not raise all of the five crops studied, and a few failed to keep adequate records on all of these crops when grown. Therefore, the number of records available for analysis was as follows: corn, 149; soybeans, 133; oats, 128; wheat, 54; hay, one cutting, 33; hay, two cuttings, 17; and hay, three cuttings, 23.

Description of Farms Studied

Land Use. Acreages of various crops are shown in Table 1 for four different farm size groups. Each size group had about the same land use pattern. Approximately 90 percent of the total farm area was used for rotated crops which were grown in the following proportions: corn and soybeans about 60 percent, oats and wheat 20 percent, and hay, rotation pasture and unharvested meadows 20 percent. Most meadows were plowed under after the first year.

Crop Production. Yields per acre for the various crops and different size farms are shown in Table 2. Corn yields on the farms studied averaged about 24 percent higher in 1959 than the average yield for the six counties in which these farms were located; soybean yields were 17 percent higher; oat yields were 25 percent higher; and wheat yields were 15 percent higher.

How Costs Were Calculated

All costs were based on 1959 production methods and prices. Labor charges, which were based on having the farm operator provide his own house and food, were calculated at $1.50 an hour. These charges could be reduced somewhat, if the farmer were given a rent-free house and a garden plot. However, this reduction in labor cost would be largely offset by a higher land charge to provide for a dwelling.

Most of the labor used in producing crops was direct field work. However, a small amount of miscellaneous labor also was used. This included such jobs as hauling fertilizer from the dealer's delivery point to the farm, getting equipment ready for use, cleaning and storing equipment after use, and making the necessary machinery repairs. The amount of miscellaneous labor charged against each acre of crop was as follows: corn, .5 of an hour; soybeans, oats, wheat and one cutting of hay, .4; two cuttings of hay, .6; and three cuttings of hay, .8 of an hour. These miscellaneous labor requirements are based on a 1958 study of crop costs in west central Ohio because only a few of the northwestern Ohio farmers kept detailed records on the amount of miscellaneous labor used. No labor or tractor time was charged against the crops for building fences or hauling manure.

Tractor and machinery charges were figured on the basis of size and number of hours used in a year. A detailed list of these charges for different size tractors and equipment and different intensities of use is given in Appendices A and B. The amount of man labor and tractor power used includes the time spent moving equipment to and from fields and the amount of time spent doing the necessary field work.

The entire amount of fertilizer and manure applied to the cropland was charged against the grain crops. No charges for fertilizer and manure were made against the meadow crops. This procedure was based on the assumption that legumes will add at least enough nitrogen in roots and stubble to offset the value of the phosphorus and potash removed by the hay crop. A commercial fertilizer charge of $6.75 also was made for each acre of meadow that was not

TABLE 1.--Average Acreage of Crops Grown on Four Groups of Farms in Northwestern Ohio in 1959

Land Use	Size of Farm in Rotated Crops			
	63-149 (40 Farms)	150-249 (60 Farms)	250-349 (31 Farms)	350-650 (22 Farms)
	Acres	Acres	Acres	Acres
Corn	41	74	107	152
Soybeans	23	50	78	109
Oats	16	25	45	72
Wheat	6	15	16	20
Hay	17	22	23	52
Meadow Not Cut	2	5	23	30
Rotation Pasture	5	5	6	5
Rotated Crops	110	196	298	440
Permanent Pasture	5	3	3	3
Woods	5	6	4	2
Miscellaneous	6	13	16	22
Total	126	218	321	467

TABLE 2.--Average Crop Yields for Different Size Farms in Northwestern Ohio in 1959

Crop	Average Size of Farm in Crop Acres	Number of Farms in Group	Yield Per Acre[1]
Corn	110	39	86
Corn	196	59	80
Corn	298	30	81
Corn	441	21	86
Soybeans	112	32	33
Soybeans	193	55	33
Soybeans	300	28	30
Soybeans	426	18	31
Oats	111	32	56
Oats	198	52	61
Oats	300	29	66
Oats	450	15	62
Wheat	141	21	26
Wheat	230	19	30
Wheat	381	14	29
Hay-1 cutting	240	33	1.6
Hay-2 cuttings	188	17	2.7
Hay-3 cuttings	171	23	3.2

[1]Grain stated in bushels; hay stated in tons.

harvested. This procedure was an attempt to charge the succeeding grain crops for the benefits of the meadow top-growth that could have been harvested as hay but instead was plowed under.

Two steps were used in calculating fertilizer and manure charges for the grain crops. The first one was to determine the value of all fertilizer and manure applied to the rotated land. To this fertilizer charge was added $6.75 for each acre of meadow that was not harvested. The second step was to prorate these fertilizer and manure charges to the various grain crops, and straw when harvested, on the basis of the way each crop removes nitrogen, phosphorus and potash from the soil.[1] This method of figuring fertilizer and manure costs gives meadow crops some credit for the beneficial effects they impart to succeeding grain crops. It also comes closer to showing the actual costs of supplying mineral nutrients to the grain crops than is possible when a portion of the fertilizer and manure is charged against the meadow crop.

Fertilizer was charged at actual cost. The analyses most commonly used and their costs per ton were: 12-12-12, $70; 6-24-12, $73; 5-20-20, $70; 3-12-12, $46; and ammonium nitrate, $78. Manure was valued at $2 a ton.

Cost of lime was prorated equally among the various crops grown on the rotated land. Price paid per ton including spreading averaged $3.50 for agricultural ground limestone.

A land charge of $18 an acre was figured for each crop. After deducting an annual tax of $2.50 an acre, the remaining land charge allowed a five percent return on a $310 land valuation. This land charge did not include the use of a farm house for the operator or any costs for livestock buildings. If a dwelling is included, a higher land charge should be made. The same land charge was used for each farm because of the difficulty of determining the true market value of the cropland for each farm.

Costs For Different Crops

Corn. The cost of producing corn on a group of medium size farms averaging 196 crop acres in size was about $58 an acre or 78 cents a bushel when a 75 bushel yield was obtained. Corn production costs per acre declined as size of farm increased because of smaller charges for labor, tractor power, machinery and manure (Table 3). The smaller labor costs on the large farms were due mainly to the use of large machinery which reduced the amount of man labor needed to accomplish a particular job.

A more intensive use of tractors and to some extent larger ones reduced tractor charges as size of farm increased. Reductions in machinery charges were due principally to a more intensive use of equipment since machinery costs per acre are about the same regardless of machine size, provided each piece of equipment is used the same number of hours. When machinery is used to full capacity, overhead costs per acre can be kept to the minimum for such items as depreciation, obsolescence, storage, insurance, taxes and interest.

The cost of a bushel of seed corn and a gallon of spray material was approximately the same for the different groups of farms. Seed corn averaged $10.50 a bushel and spray $3.60 a gallon.

Physical inputs used by farmers to produce an acre of corn are given in Table 4. The prorated fertilizer application in pounds was determined by dividing the prorated cost of this item in Table 3 by 3.5 cents which was the cost of a pound of 12-12-12 fertilizer. This analysis was selected because nitrogen, phosphorus and potash were applied to corn in a ratio that averaged about 1-1-1 for all farms. Applications of lime are in terms of agricultural ground limestone.

Soybeans. The cost of producing soybeans on a group of medium size farms averaging 193 crop acres in size was about $46 an acre or $1.52 a bushel when a 30 bushel yield was obtained. Total cost per acre was lower on the large farms than on the small ones because of lower charges for labor, tractor power and machinery (Table 5). Cost of soybean seed was about the same per bushel for each group of farms, the average being $2.31.

Physical inputs used by farmers to produce an acre of soybeans are shown in Table 6. The prorated fertilizer application in pounds was determined by dividing the prorated cost of this item in Table 5 by 3 cents which was the cost of a pound of 0-20-20 fertilizer. This analysis was selected because soybeans remove nitrogen, phosphorus and potash from the soil in about a 0-1-1 ratio.

Oats. The cost of producing oats on a group of medium size farms averaging 198 crop acres in size was about $42 an acre or 70 cents a bushel when a 60 bushel yield was obtained (Table 7). Total costs per acre on the large farms were about 10 percent lower than the total charges for the small farms. Costs of producing an acre of straw beyond small grain harvest are shown in Table 13. Cost of seed

[1]The amount of plant nutrients removed by different crops is given in the Handbook of Ohio Experiments in Agronomy, Ohio Agricultural Experiment Station, November, 1957, page 21.

TABLE 3.–Cost of Producing an Acre of Corn on Different Size Farms in Northwestern Ohio in 1959

Cost	Size of Farm in Rotated Crop Acres			
	63-149 Average 110 (39 Farms)	150-249 Average 196 (59 Farms)	250-349 Average 298 (30 Farms)	350-650 Average 441 (21 Farms)
Man Labor	$ 9.60	$ 8.85	$ 7.50	$ 7.20
Tractor Power	7.58	6.86	5.68	5.38
Machinery	9.32	8.27	7.60	6.80
Fertilizer	11.58	11.87	12.92	12.65
Manure	4.40	1.95	1.50	1.01
Lime	.16	.10	.08	.00
Seed	2.12	2.09	2.07	2.07
Spray	.24	.25	.24	.33
Land	18.00	18.00	18.00	18.00
Total[1]	$63.00	$58.24	$55.59	$53.44

[1]Tests for significance of differences between costs are shown in Appendix C.

oats averaged 90 cents a bushel.

Physical inputs used by farmers to produce an acre of oats are given in Table 8. The prorated fertilizer application in pounds was determined by dividing the prorated cost of this item in Table 7 by 2.5 cents which was the cost of a pound of 5-10-10 fertilizer. This analysis was selected because nitrogen, phosphorus and potash were applied to oats in a ratio that averaged about 1-2-2 for all farms.

Applications of fertilizer and manure in Table 8 represent only the amount prorated to the grain crop. These rates do not include the amount prorated to the straw when harvested and removed from the oat field.

Wheat. The cost of producing wheat on a group of medium size farms averaging 230 crop acres in size was about $47 an acre or $1.46 a bushel when a 32 bushel yield was obtained (Table 9). Cost of seed wheat averaged $2.05 a bushel.

In the fall of 1958, wheat was sown on most of the farms in this study. But only one-third of the farmers harvested a crop in 1959 because of severe winter damage. This situation reduced the number of wheat records to the point where only three groupings seemed practical.

TABLE 4.–Physical Inputs Used to Produce an Acre of Corn on Different Size Farms in Northwestern Ohio in 1959

	Size of Farm in Rotated Crop Acres			
	63-149 Average 110 (39 Farms)	150-249 Average 196 (59 Farms)	250-349 Average 298 (30 Farms)	350-650 Average 441 (21 Farms)
Man Labor, hours	6.4	5.9	5.0	4.8
Tractor Power – 2 plow, hours	3.2	2.1	1.0	1.1
Tractor Power – 3 plow, hours	2.5	2.7	2.7	2.2
Tractor Power – 4 plow, hours	.0	.3	.5	.8
Fertilizer, pounds[1]	331	339	369	361
Manure, tons	2.2	1.0	.8	.5
Lime, pounds	80	65	45	0
Seed, pounds	11.2	11.0	11.5	11.5
Spray, pints	.5	.5	.5	.7

[1]Adjusted to a 12-12-12 analysis that cost $70 a ton.

TABLE 5.—Cost of Producing an Acre of Soybeans on Different Size Farms in Northwestern Ohio in 1959

Cost	Size of Farm in Rotated Crop Acres			
	63-149 Average 112 (32 Farms)	150-249 Average 193 (55 Farms)	250-349 Average 300 (28 Farms)	350-560 Average 426 (18 Farms)
Man Labor	$ 8.10	$ 7.50	$ 6.15	$ 5.25
Tractor Power	6.30	5.54	4.33	3.28
Machinery	8.39	8.10	7.14	7.13
Fertilizer	2.98	3.00	3.14	3.09
Manure	.86	.51	.34	.19
Lime	.18	.12	.08	.00
Seed	2.91	2.87	2.72	2.83
Land	18.00	18.00	18.00	18.00
Total[1]	$47.72	$45.64	$41.90	$39.77

[1]Tests for significance of differences between costs are shown in Appendix C.

TABLE 6.—Physical Inputs Used to Produce an Acre of Soybeans on Different Size Farms in Northwestern Ohio in 1959

	Size of Farm in Rotated Crop Acres			
	63-149 Average 112 (32 Farms)	150-249 Average 193 (55 Farms)	250-349 Average 300 (28 Farms)	350-560 Average 426 (18 Farms)
Man Labor, hours	5.4	5.0	4.1	3.5
Tractor Power – 2 plow, hours	2.6	1.7	1.0	1.0
Tractor Power – 3 plow, hours	2.0	2.1	2.0	1.3
Tractor Power – 4 plow, hours	.1	.3	.3	.3
Fertilizer, pounds[1]	99	100	105	103
Manure, tons	.4	.3	.2	.1
Lime, pounds	90	80	45	0
Seed, bushels	1.2	1.2	1.2	1.2

[1]Adjusted to a 0-20-20 analysis that cost $60 a ton.

TABLE 7.—Cost of Producing an Acre of Oats on Different Size Farms in Northwestern Ohio in 1959

Cost	Size of Farm in Rotated Crop Acres			
	65-149 Average 111 (32 Farms)	150-249 Average 198 (52 Farms)	250-349 Average 300 (29 Farms)	350-650 Average 450 (15 Farms)
Man Labor	$ 4.95	$ 4.65	$ 4.05	$ 3.75
Tractor Power	3.39	3.41	2.48	1.97
Machinery	7.10	6.98	6.46	6.23
Fertilizer	5.41	5.72	6.34	6.51
Manure	1.79	.99	.77	.34
Lime	.19	.12	.08	.00
Seed	2.23	2.31	2.55	2.27
Land	18.00	18.00	18.00	18.00
Total[1]	$43.06	$42.18	$40.73	$39.07

[1]Tests for significance of differences between costs are shown in Appendix C.

TABLE 8.–Physical Inputs Used to Produce an Acre of Oats on Different Size Farms in Northwestern Ohio in 1959

	Size of Farm in Rotated Crop Acres			
	65-149 Average 111 (32 Farms)	150-249 Average 198 (52 Farms)	250-349 Average 300 (29 Farms)	350-650 Average 450 (15 Farms)
Man Labor, hours	3.3	3.1	2.7	2.5
Tractor Power – 2 plow, hours	1.4	.9	.6	.7
Tractor Power – 3 plow, hours	1.1	1.4	1.1	.7
Tractor Power – 4 plow, hours	.0	.2	.2	.2
Fertilizer, pounds[1]	216	229	254	260
Manure, tons	.9	.5	.4	.2
Lime, pounds	95	75	45	0
Seed, bushels	2.5	2.7	2.6	2.5

[1]Adjusted to a 5-10-10 analysis that cost $50 a ton.

Physical inputs used by farmers to produce an acre of wheat are given in Table 10. The prorated fertilizer application in pounds was determined by dividing the prorated cost of this item in Table 9 by 2.5 cents which was the cost of a pound of 5-10-10 fertilizer. This analysis was selected because nitrogen, phosphorus and potash were applied to wheat in a ratio that averaged about 1-2-2 for all farms. Applications of fertilizer and manure include only the amount prorated to the grain crop.

Hay. The cost of producing hay on a group of farms averaging 240 crop acres in size was about $37 an acre or $22.90 a ton when only one cutting of 1.6 tons was made and no pasturing was done the remainder of the season (Table 11).

When two cuttings of hay yielding 2.7 tons per acre were harvested, total costs increased to about $50 an acre or $18.60 a ton for a group of farms averaging 188 crop acres in size.

When three cuttings of hay yielding 3.2 tons per

TABLE 9.–Cost of Producing an Acre of Wheat on Different Size Farms in Northwestern Ohio in 1959

	Size of Farm in Crop Acres		
Cost	88-199 Average 141 (21 Farms)	200-299 Average 230 (19 Farms)	300-560 Average 381 (14 Farms)
Man Labor	$ 6.00	$ 5.25	$ 4.80
Tractor Power	4.90	4.01	3.23
Machinery	7.20	7.28	6.45
Fertilizer	6.49	6.80	7.10
Manure	1.69	.98	1.27
Lime	.12	.03	.00
Seed	4.51	4.34	4.23
Land	18.00	18.00	18.00
Total[1]	$48.91	$46.69	$45.08

[1]Tests for significance of differences between costs are shown in Appendix C.

TABLE 10.–Physical Inputs Used to Produce an Acre of Wheat on Different Size Farms in Northwestern Ohio in 1959

	Size of Farm in Crop Acres		
	88-199 Average 141 (21 Farms)	200-299 Average 230 (19 Farms)	300-560 Average 381 (14 Farms)
Man Labor, hours	4.0	3.5	3.2
Tractor Power – 2 plow, hours	1.3	.7	.7
Tractor Power – 3 plow, hours	1.9	2.0	1.2
Tractor Power – 4 plow, hours	.2	.2	.5
Fertilizer, pounds[1]	260	272	284
Manure, tons	.8	.5	.6
Lime, pounds	55	25	0
Seed, bushels	2.1	2.1	2.1

[1]Adjusted to a 5-10-10 analysis that cost $50 a ton.

acre were harvested, production costs averaged about $57 an acre or $17.80 a ton for a group of farms averaging 171 crop acres in size.

Seed costs averaged $22 a bushel for alfalfa, $21 for red clover and $9 a bushel for timothy. The average cost of spray material was $4 a gallon.

Physical inputs used by farmers to produce an acre of hay are shown in Table 12. Seeding rates for meadows cut once included 5.6 pounds of alfalfa, 4.7 pounds of red clover and 1.9 pounds of timothy per acre. Seeding rates for meadows cut twice were as follows: alfalfa 8.2 pounds, red clover 2.1 pounds and timothy 2.9 pounds. For meadows cut three times, seeding rates were 9.7 pounds per acre for alfalfa, 1.2 pounds for red clover and 2.9 pounds for timothy.

Straw. The additional cost of producing an acre of straw beyond small grain harvest was $13.45 for a yield of .9 of a ton (Table 13). This figure includes a prorated fertilizer charge which would pay for about 75 pounds of a 5-10-10 analysis and a prorated manure charge for .2 of a ton per acre. It does not include any charge for the use of the land because this item was

TABLE 11.–Cost of Producing an Acre of Hay in Northwestern Ohio in 1959[1]

Cost	One Cutting; 240 Crop Acres Per Farm (33 Farms)	Two Cuttings; 188 Crop Acres Per Farm (17 Farms)	Three Cuttings; 171 Crop Acres Per Farm (23 Farms)
Man Labor	$ 5.25	$10.20	$12.30
Tractor Power	2.37	5.71	7.01
Machinery	5.95	9.95	13.10
Fertilizer and Manure	.00	.00	.00
Lime	.05	.18	.11
Seed	4.03	4.44	4.58
Spray	.11	.11	.00
Twine and Wire	.95	1.75	2.05
Land	18.00	18.00	18.00
Total	$36.71	$50.34	$57.15

[1]Some inconsistencies exist between the various costs of harvesting one, two and three cuttings of hay. These discrepancies may be due to the fact that the various cuttings were harvested on different farms.

TABLE 12.–Physical Inputs Used to Produce an Acre of Hay in Northwestern Ohio in 1959

	One Cutting; 240 Crop Acres Per Farm (33 Farms)	Two Cuttings; 188 Crop Acres Per Farm (17 Farms)	Three Cuttings; 171 Crop Acres Per Farm (23 Farms)
Man Labor, hours	3.5	6.8	8.2
Tractor Power – 2 plow, hours	1.2	2.2	3.3
Tractor Power – 3 plow, hours	.8	1.7	1.9
Tractor Power – 4 plow, hours	.0	.4	.2
Lime, pounds	35	95	60
Clover and Alfalfa Seed, pounds	10.3	10.3	10.9
Grass Seed, pounds	1.9	2.9	2.9
Spray, pint	.2	.2	.0

charged completely against the oat and wheat crops. Man labor used per acre amounted to 2.6 hours. Power requirements averaged 1.1 hours for a two-plow tractor and .7 of an hour for a three-plow tractor.

How Size of Farm Affects Crop Costs and Profits[1]

Preceding figures do not show exactly how size of farm influenced crop costs because all other factors did not remain the same as size of farm increased. For example, the manure charge for corn averaged $3.39 less per acre on the large farms than on the small ones, yet the reported yields were the same in each case. Smaller variations also occurred in other cost items.

Calculations in Table 14 show how size of farm affects crop costs per acre when charges for fertilizer, manure, lime, seed, and spray and use of land were held constant on the individual farms. In this procedure, the average charge for these items was used instead of the actual expenses so that any changes in cost could be attributed solely to differences in size of farm and equipment used.

The same yields were used to calculate gross receipts for the different size farms. This procedure was based on the assumption that yields would be the same regardless of farm size when all factors were held constant, except size of tractors and machinery used. By using this procedure to determine receipts and expenses, changes in profits could occur only as a result of increasing or decreasing the number of acres farmed or changing the size and kind of tractors and machinery used.

Costs of producing an acre of corn, soybeans, oats and wheat declined as size of farm increased. However, most of this cost reduction occurred before size of farm reached 300 crop acres because size of machines and intensity of use did not increase much on farms above this acreage.

An increase in rotated crops from 110 to 440 acres reduced the cost of producing an acre of corn and soybeans about $7 and an acre of oats $3.50. On a percentage basis, this reduction in costs amounted to 12 percent for corn, 15 percent for soybeans and 8 percent for oats. About two-thirds of these reductions in cost were due to lower tractor and machinery

TABLE 13.–Cost of Producing an Acre of Straw Beyond Small Grain Harvest on 54 Farms in Northwestern Ohio in 1959

Cost	Cost Per Acre[1] (.9 ton yield)
Man Labor	$ 3.90
Tractor Power	2.26
Machinery	4.40
Twine and Wire	.58
Fertilizer[2]	1.84
Manure[2]	.47
Total	$13.45

[1]A more detailed discussion of this subject for a similar area is given in the following publication: Blosser, R. H., Crop Costs and Returns in West Central Ohio, Ohio Agricultural Experiment Station, Research Bulletin No. 909, June, 1962.

[1]All land costs were charged against the oat and wheat crops.

[2]These charges were calculated by the same method that was used to prorate fertilizer and manure charges for the grain crops.

TABLE 14.—How Size of Farm Affects Crop Costs and Profits Per Acre in Northwestern Ohio

Cost and Size of Farm in Crop Acres	Receipts	Expenses					Profits
		Man Labor	Tractor Power	Machinery	Other	Total	
Corn							
110 Acres	$75.00	$9.60	$7.60	$9.30	$34.90[1]	$61.40	$13.60
196 Acres	75.00	8.85	6.85	8.25	34.90[1]	58.85	16.15
298 Acres	75.00	7.50	5.70	7.60	34.90[1]	55.70	19.30
441 Acres	75.00	7.20	5.40	6.80	34.90[1]	54.30	20.70
Soybeans							
112 Acres	60.00	8.10	6.30	8.40	24.50[2]	47.30	12.70
193 Acres	60.00	7.50	5.55	8.10	24.50[2]	45.65	14.35
300 Acres	60.00	6.15	4.35	7.15	24.50[2]	42.15	17.85
426 Acres	60.00	5.25	3.30	7.15	24.50[2]	40.20	19.80
Oats							
111 Acres	39.00	4.95	3.40	7.10	27.40[3]	42.85	-3.85
198 Acres	39.00	4.65	3.40	7.00	27.40[3]	42.45	-3.45
300 Acres	39.00	4.05	2.50	6.45	27.40[3]	40.40	-1.40
450 Acres	39.00	3.75	1.95	6.25	27.40[3]	39.35	- .35
Wheat							
141 Acres	56.00	6.00	4.90	7.20	30.55[4]	48.65	7.35
230 Acres	56.00	5.25	4.00	7.30	30.55[4]	47.10	8.90
381 Acres	56.00	4.80	3.25	6.45	30.55[4]	45.05	10.95

[1]Includes $12.10 for fertilizer, $2.35 for manure, $.10 for lime, $2.10 for seed, $.25 for spray and $18.00 for use of land.

[2]Includes $3.05 for fertilizer, $.50 for manure, $.10 for lime, $2.85 for seed, and $18.00 for use of land.

[3]Includes $5.90 for fertilizer, $1.05 for manure, $.10 for lime, $2.35 for seed, and $18.00 for use of land.

[4]Includes $6.80 for fertilizer, $1.30 for manure, $.05 for lime, $4.40 for seed, and $18.00 for use of land.

charges and the remaining one-third resulted from using a smaller amount of labor per acre.

Why Costs Decline. Labor costs for corn, soybeans, oats and wheat declined substantially as size of farm increased up to 300 crop acres because larger tractors and machinery reduced the amount of time required to perform a specific job. However, a similar cost study for west central Ohio showed that size of farm had little effect on reducing the labor charges for an acre of hay because the same size mower, rake and approximately the same size baler were used regardless of farm size.

Tractor costs per acre declined as size of farm increased because of more intensive use and larger size tractors. Many farmers did not use their tractors enough hours each year to reduce hourly charges to somewhere near the minimum. On the small farms, tractor use averaged only 350 hours a year. But on the large farms, tractor use averaged more than 600 hours annually. These figures are based on tractor equivalents which take into consideration the age of the tractor. Tractors less than 13 years of age were given a tractor equivalent rating of one; tractors 13 to 16 years old were given a rating of one-half; tractors 17 to 20 years old were given a rating of one-fourth; and tractors 21 years old or over were given a tractor equivalent rating of one-tenth. Tractor charges in Appendix B show how hourly costs decline as annual use increases. For example, a three-bottom plow tractor costs $1.70 an hour to operate when it is used only 300 hours a year. But when it is used 600 hours annually, cost per acre declines to $1.30.

Machinery costs declined as size of farm increased because of a more intensive use of equipment. The cost of using each piece of machinery was calculated from the hourly rates shown in Appendix A. These figures showed higher hourly costs as size of machine increased. But on an acre basis, machinery charges were about the same regardless of machine size, provided each piece of equipment was used the same number of hours. In other words, as size of machine increased, savings in time amounted to enough to keep machinery charges approximately the same on an acre basis if hours of use remained the same.

Figures in Appendix A show that costs of using most pieces of machinery decline quite rapidly until use exceeds 100 hours a year. However, many farmers on small farms did not use their harvesting equipment

this intensively. Machinery costs per acre depend largely on how efficiently the harvesting equipment is used. On a 300 acre farm, corn pickers and combines are responsible for about 50 percent of the machinery charges for producing corn, soybeans, oats and wheat. However, farmers on small farms can compete with operators of large tracts of land on a unit cost basis if they (1) hire crops harvested; (2) own harvesting equipment and do enough custom work on other farms to use the machine at least 100 hours a year; or (3) purchase secondhand harvesting equipment when a new machine would become obsolete before it wears out.

Profits From Different Crops

Profits from an acre of the various grain crops grown on a 220-acre farm were about $16 for corn, $14 for soybeans and $9 for wheat (Table 14). These profits were left even after making a land charge of $18 an acre and allowing all labor $1.50 an hour. Larger farms showed profits that were higher than these figures while smaller farms produced lower returns. This same method of figuring showed that oats produced an average loss of about $3 an acre. In some cases, profits from wheat and oats might be increased slightly by selling the straw. Yields used in calculating gross receipts per acre were 75 bushels for corn, 30 bushels for soybeans, 60 bushels for oats and 32 bushels for wheat. These yields are the estimated "normal" production for the average farmer in this study and were determined by increasing the 1955-59 yields for the six-county area as follows: corn 24 percent, soybeans 17 percent, oats 25 percent and wheat 15 percent. These percentages show how much higher the 1959 reported grain yields were on the average farm in this study compared with the average farm for the six counties.

One cutting of hay produced a loss of $5 an acre when the yield was 1.6 tons; two cuttings of hay gave a profit of $4 an acre when the yield was 2.7 tons; and three cuttings of hay produced a profit of $7 an acre when the yield was 3.2 tons.

Prices used to determine gross receipts were as follows: corn, $1.00 a bushel; soybeans, $2.00; oats, $.65; wheat, $1.75 a bushel; and hay $20 a ton at the farm.

In many cases, a good crop farmer will not have the lowest possible crop costs on an acre basis because of heavy expenditures for fertilizer and lime and higher harvesting charges. However, if he obtains high yields, he will have low costs per bushel of grain or ton of hay produced which means high profits per acre.

Profits from individual crops can be used to indicate roughly which crops should be grown to maximize net farm income. But a more accurate analysis is possible when crop costs and returns are studied on a rotation basis. This procedure eliminates the need for allocating joint costs for such items as fertilizer, manure, lime and use of the land. It also considers the yield-increasing effects of meadows on succeeding grain crops.

Amount of Time Used for Specific Crop Work

The amount of man labor, tractor power and machine time used to perform the various jobs needed to produce crops is shown in Table 15. These time requirements are stated in two ways. One is an average figure that shows the amount of time reported by the median farmer in each job group. The other shows the range in the amount of time used by the middle 50 percent of the farmers to perform a particular job. The amount of work accomplished in a given time with a certain size machine varied considerably because of differences in the rate of travel machines were operated, frequency of equipment breakdowns, amount of time needed to move machines to and from fields, weather, yields and size of fields.

TABLE 15.–Labor and Power Used Per Acre to do Various Jobs Needed to Produce Crops in Northwestern Ohio in 1959

Operation	Number of Cases	Size of Tractor in Plows	Size of Machine Operated	Man Hours Used Per Acre[1] Average	Man Hours Used Per Acre[1] Range for Middle Half of Farms
Plow	22	2	2-14"	1.27	1.14-1.36
Plow	11	3	2-14"	1.08	1.00-1.23
Plow	45	3	3-12"	.90	.73-1.00
Plow	128	3	3-14"	.86	.72-1.00
Plow	12	4	4-14"	.66	.63- .69
Plow	8	5	5-14"	.56	.53- .60
Disk	18	2	7 ft.	.38	.33- .48
Disk	101	3	7 ft.	.38	.33- .48
Disk	28	2	8 ft.	.43	.37- .55
Disk	79	3	8 ft.	.34	.29- .42
Disk	22	3	9 ft.	.33	.28- .35
Disk	56	3	10 ft.	.29	.27- .45
Disk	13	4	10 ft.	.24	.22- .28
Disk	42	3	12 ft.	.25	.21- .28
Harrow with spiketooth	18	2,3	10 ft.	.27	.25- .30
Harrow with spiketooth	13	2,3	12 ft.	.21	.20- .30
Harrow with springtooth	16	3	10 ft.	.26	.23- .32
Harrow with springtooth	22	3,4	12 ft.	.23	.20- .27
Drag	13	2,3	8 ft.	.38	.28- .48
Plant corn – 38" to 40" rows	46	2,3	2 row	.55	.50- .64
Plant corn – 38" to 40" rows	95	2,3	4 row	.26	.23- .32
Plant soybeans – 38" to 40" rows	27	2,3	2 row	.56	.50- .67
Plant soybeans – 38" to 40" rows	70	2,3	4 row	.26	.22- .32
Rotary hoe corn and soybeans	58	2,3	2 row	.23	.20- .25
Rotary hoe corn and soybeans	69	2,3	4 row	.15	.12- .20
Cultivate corn – 1st time	78	2,3	2 row	.50	.39- .58
Cultivate corn – 2nd time	44	2,3	2 row	.39	.34- .48
Cultivate corn – 1st time	64	2,3	4 row	.26	.22- .33
Cultivate corn – 2nd time	34	2,3	4 row	.22	.19- .25
Cultivate soybeans – 1st time	42	2,3	2 row	.52	.47- .63
Cultivate soybeans – 2nd time	35	2,3	2 row	.45	.36- .52
Cultivate soybeans – 1st time	54	2,3	4 row	.27	.23- .33
Cultivate soybeans – 2nd time	49	2,3	4 row	.23	.19- .28
Pick corn – 80 bu.	27	2,3	1 row	1.40	1.04-1.75
Pick corn – 70 bu.	40	2,3	2 row	.83	.69-1.00
Pick corn – 90 bu.	46	2,3	2 row	.93	.77-1.04
Haul and store corn – 70 bu.	62	2,3	---	.85[2]	.69-1.00[14]
Haul and store corn – 90 bu.	57	2,3	---	1.00[3]	.74-1.24[14]
Drill oats	15	2,3	12 x 7 in.	.53	.48- .66
Drill oats	30	2,3	13 x 7 in.	.44	.39- .57
Drill oats	6	2,3	15 x 7 in.	.42	.39- .60
Drill oats	16	2,3	16 x 7 in.	.35	.29- .36
Drill oats	26	2,3	17 x 7 in	.35	.30- .47
Disk and drill oats	10	2,3	12 x 7 in.	.52	.44- .75
Disk and drill oats	17	2,3	13 x 7 in.	.46	.38- .50
Drill wheat	15	2,3	12 x 7 in.	.55	.40- .60
Drill wheat	25	2,3	13 x 7 in.	.50	.41- .59
Drill wheat	7	2,3	15 x 7 in.	.42	.38- .48
Drill wheat	11	2,3	16 x 7 in.	.40	.29- .46
Drill wheat	16	2,3	17 x 7 in.	.33	.29- .40
Combine soybeans	16	2,3	5 ft.	.84	.70-1.00
Combine soybeans	43	2,3	6 ft.	.80	.68-1.02
Combine soybeans	19	2,3	7 ft.	.71	.63- .93
Combine soybeans	7	SP[15]	10 ft.	.54	.52- .56
Combine soybeans	26	SP	12 ft.	.40	.34- .50

TABLE 15.--Continued--Labor and Power Used Per Acre to do Various Jobs Needed to Produce Crops in Northwestern Ohio in 1959.

Operation	Number of Cases	Size of Tractor in Plows	Size of Machine Operated	Man Hours Used Per Acre[1] Averaged	Man Hours Used Per Acre[1] Range for Middle Half of Farms
Combine oats	14	2,3	5 ft.	.84	.76-1.35
Combine oats	38	2,3	6 ft.	.76	.61-1.00
Combine oats	20	2,3	7 ft.	.62	.53- .69
Combine oats	7	SP	10 ft.	.50	.40- .60
Combine oats	23	SP	12 ft.	.42	.33- .50
Combine wheat	6	2,3	5 ft.	.90	.62-1.31
Combine wheat	14	2,3	6 ft.	.70	.60- .85
Combine wheat	11	2,3	7 ft.	.67	.54- .74
Combine wheat	3	SP	10 ft.	.43	-- --
Combine wheat	7	SP	12 ft.	.42	.38- .54
Combine soybeans – 27 bu.	59	2,3	5-12 ft.	.68	.52- .92
Combine soybeans – 38 bu.	56	2,3	5-12 ft.	.75	.55- .88
Combine oats – 47 bu.	49	2,3	5-12 ft.	.60	.47- .82
Combine oats – 72 bu.	58	2,3	5-12 ft.	.63	.53- .80
Combine wheat – 21 bu.	19	2,3	5-12 ft.	.62	.52- .82
Combine wheat – 34 bu.	24	2,3	5-12 ft.	.67	.50- .71
Haul and store soybeans – 27 bu.	62	2,3	--	.46[4]	.35- .70[14]
Haul and store soybeans – 37 bu.	59	2,3	--	.52[5]	.30- .66[14]
Haul and store oats – 47 bu.	52	2,3	--	.51[6]	.38- .67[14]
Haul and store oats – 72 bu.	60	2,3	--	.56[7]	.43- .69[14]
Haul and store wheat – 21 bu.	22	2,3	--	.39[8]	.27- .50[14]
Haul and store wheat – 34 bu.	24	2,3	--	.40[9]	.30- .50[14]
Mow hay – 1.0 ton	39	2,3	7 ft.	.41	.35- .50
Mow hay – 1.7 tons	34	2,3	7 ft.	.43	.38- .50
Mow straw – .9 ton	72	2,3	7 ft.	.42	.34- .51
Rake hay – 1.0 ton	38	2,3	7 ft.	.39	.33- .49
Rake hay – 1.7 tons	30	2,3	7 ft.	.42	.34- .50
Rake straw – .9 ton	56	2,3	7 ft.	.36	.30- .50
Bale hay – 1.0 ton	25	2,3	--	.41	.35- .50
Bale hay – 1.7 tons	21	2,3	--	.50	.42- .62
Bale straw – .9 ton	42	2,3	--	.43	.30- .50
Haul and store hay – 1.0 ton	30	2,3	--	1.19[10]	.79-1.35[14]
Haul and store hay – 1.8 tons	26	2,3	--	1.55[11]	1.00-2.00[14]
Haul and store straw – .6 ton	21	2,3	--	.94[12]	.62-1.00[14]
Haul and store straw – 1.1 tons	20	2,3	--	1.25[13]	.94-1.71[14]
Spray corn	48	2,3	6 row	.20	.14- .23
Spray corn	27	2,3	7 row	.18	.13- .23
Spray corn	20	2,3	8 row	.14	.12- .16
Spread fertilizer	39	2,3	10 ft.	.26	.21- .35
Spread fertilizer	6	2,3	12 ft.	.24	.20- .30
Spread fertilizer	6	2,3	17 ft.	.18	.16- .32

[1]Number of tractor and machine hours used per acre is also the same as the number of man hours unless otherwise stated.

[2]Tractor time, .70 hour.

[3]Tractor time, .80 hour.

[4]Tractor time, .44 hour.

[5]Tractor time, .46 hour.

[6]Tractor time, .43 hour.

[7]Tractor time, .45 hour.

[8]Tractor time, .30 hour.

[9]Tractor time, .35 hour.

[10]Tractor time, .50 hour.

[11]Tractor time, .54 hour.

[12]Tractor time, .40 hour.

[13]Tractor time, .45 hour.

[14]These range figures apply only to man hours.

[15]SP stands for self propelled.

Appendix Table A.–Machinery Charges Used in Calculating Crop Costs[1] (Based on size of machine and hours of use)

Machine and Size	Cost Per Hour When Used						
	20 hrs. Per Year	40 hrs. Per Year	60 hrs. Per Year	100 hrs. Per Year	150 hrs. Per Year	250 hrs. Per Year	350 hrs. Per Year
Tractor plow – 2-14"	$ 2.00	$ 1.05	$ .75	$ .50	$ .40	$ .37	$ .34
Tractor plow – 3-12"	2.75	1.45	1.05	.70	.54	.50	.48
Tractor plow – 3-14"	3.10	1.65	1.20	.80	.60	.56	.54
Tractor plow – 4-14"	4.20	2.20	1.55	1.05	.85	.76	.72
Tractor plow – 5-14"	5.20	2.75	1.95	1.30	1.05	.95	.90
Disk – 7 ft.	2.15	1.10	.75	.45	.35	.31	.29
Disk – 8 ft.	2.30	1.20	.80	.50	.38	.33	.31
Disk – 9 ft.	2.45	1.25	.85	.55	.40	.35	.33
Disk – 10 ft.	2.65	1.35	.95	.60	.44	.38	.36
Disk – 12 ft.	2.90	1.50	1.00	.65	.48	.42	.39
Spiketooth harrow – 10 ft.	.35	.18	.12	.07	.06	.05	.05
Spiketooth harrow – 12 ft.	.40	.21	.15	.09	.07	.06	.06
Springtooth harrow – 10 ft.	.90	.45	.30	.20	.15	.13	.12
Springtooth harrow – 12 ft.	1.05	.55	.35	.25	.18	.15	.14
Drag – 8 ft.	.35	.18	.12	.07	.06	.06	.06
Corn planter – 2 row	1.75	.90	.65	.55	.50	.45	.42
Corn planter – 4 row	3.35	1.75	1.20	1.00	.90	.85	.80
Grain drill – 12 x 7 in.	3.20	1.70	1.15	.95	.85	.80	.75
Grain drill – 13 x 7 in.	3.40	1.80	1.25	1.00	.90	.85	.80
Grain drill – 15 x 7 in.	3.80	2.00	1.35	1.10	1.00	.95	.90
Grain drill – 16 x 7 in.	4.00	2.10	1.45	1.20	1.10	1.00	.95
Grain drill – 17 x 7 in.	4.20	2.20	1.50	1.25	1.15	1.05	1.00
Rotary hoe – 2 row	1.30	.65	.45	.30	.25	.23	.21
Rotary hoe – 4 row	2.50	1.30	.85	.55	.48	.44	.41
Cultivator – 2 row	2.10	1.05	.75	.50	.35	.25	.23
Cultivator – 4 row	4.15	2.15	1.45	.95	.70	.50	.45
Sprayer – 6 row	1.12	.57	.39	.25	.18	.16	.15
Sprayer – 7 row	1.19	.61	.42	.26	.19	.17	.16
Sprayer – 8 row	1.27	.65	.45	.28	.20	.18	.17
Corn picker – 1 row	10.20	5.25	3.60	2.25	1.60	1.40	1.25
Corn picker – 2 row	15.65	8.05	5.50	3.50	2.45	2.15	1.90
Combine, pull type – 5 ft.	13.40	6.90	4.70	3.00	2.10	1.60	1.50
Combine, pull type – 6 ft.	16.40	8.40	5.80	3.60	2.60	1.90	1.80
Combine, pull type – 7 ft.	22.40	11.50	7.90	5.00	3.50	2.60	2.50
Combine, self-propelled – 10 ft.[2]	41.60	21.70	15.10	9.75	7.10	5.50	5.20
Combine, self-propelled – 12 ft.[2]	49.20	25.70	17.80	11.50	8.40	6.50	6.20
Mower – 7 ft.	2.70	1.40	1.00	.65	.50	.42	.40
Side delivery rake – 7 ft.	2.90	1.50	1.10	.70	.65	.60	.55
Hay baler – twine[3]	12.50	6.40	4.35	2.75	1.95	1.40	1.30
Hay baler – wire[3]	15.75	8.05	5.50	3.45	2.45	1.80	1.65
Elevator	2.80	1.45	1.00	.60	.55	.50	.45
Fertilizer and lime drill – 10 ft.	1.60	.85	.60	.50	.45	.40	.38
Fertilizer and lime drill – 12 ft.	1.85	1.00	.65	.55	.50	.45	.43
Fertilizer and lime drill – 17 ft.	2.60	1.40	.90	.75	.70	.65	.61

[1]Calculated from figures given in the follwoing article: Richey, C. B., "Crop Machines Use" Agricultural Engineers' Yearbook, published by American Society of Agricultural Engineers, 1959 edition, page 106.

[2]Includes gasoline and oil.

[3]Does not include cost of baling twine or wire.

Appendix Table B.–Tractor Charges Used in Calculating Crop Costs [1] (Based on size of tractor and hours of use)

Size	Cost Per Hour When Used					
	300 hrs. Per Year	400 hrs. Per Year	500 hrs. Per Year	600 hrs. Per Year	700 hrs. Per Year	800 hrs. Per Year
2 – plow	$1.25	$1.10	$1.00	$ .90	$ .80	$ .75
3 – plow	1.70	1.50	1.40	1.30	1.20	1.15
4 – plow	2.15	1.90	1.80	1.70	1.60	1.55

[1]These charges are based on data from the following publications:

Farm Management Handbook, Department of Agricultural Economics, New York State College of Agriculture, Cornell University, Ithaca, New York, A. E. Ext. 2, December 1958.

Day, C. L. and M. M. Jones, "Farm Tractor Costs" University of Missouri, College of Agriculture, Agricultural Experiment Station, Bulletin 662, October, 1955.

Mueller, A. G., "Detailed Cost Report for Northern Illinois, 1956" Department of Agricultural Economics, College of Agriculture, University of Illinois, Urbana, Illinois, Research Report AERR-21, March, 1958.

Appendix Table C.–Levels of Significance for Mean Costs in Tables 3, 5, 7 and 9

Crop	First Group		Second Group		Difference in Cost	t Value
	Size of Farm	Cost per Acre	Size of Farm	Cost per Acre		
Corn	110	$63.00	196	$58.24	$4.76	3.15**
Corn	110	63.00	298	55.59	7.41	4.41**
Corn	110	63.00	441	53.44	9.56	5.72**
Corn	196	58.24	298	55.59	2.65	1.85
Corn	196	58.24	441	53.44	4.80	3.37**
Corn	298	55.59	441	53.44	2.15	1.34
Soybeans	112	47.72	193	45.64	2.08	2.05*
Soybeans	112	47.72	300	41.90	5.82	5.34**
Soybeans	112	47.72	426	39.77	7.95	7.97**
Soybeans	193	45.64	300	41.90	3.74	3.99**
Soybeans	193	45.64	426	39.77	5.87	7.09**
Soybeans	300	41.90	426	39.77	2.13	2.32*
Oats	111	43.06	198	42.18	.88	.93
Oats	111	43.06	300	40.73	2.33	2.17*
Oats	111	43.06	450	39.07	3.99	3.41**
Oats	198	42.18	300	40.73	1.45	1.52
Oats	198	42.18	450	39.07	3.11	2.94**
Oats	300	40.73	450	39.07	1.66	1.42
Wheat	141	48.91	230	46.69	2.22	1.34
Wheat	141	48.91	381	45.08	3.83	2.26*
Wheat	230	46.69	381	45.08	1.61	.87

*Significant at .05 level.

**Significant at .01 level.

Appendix Table D.–Range in Crop Costs Per Acre for 1959 for Middle Half on Northwestern Ohio Farms

Crop	Size of Farm in Rotated Crop Acres			
	63 – 149	150 – 249	250 – 349	350 – 650
Corn	$57.70 – 68.07	$54.08 – 62.20	$50.07 – 60.22	$48.99 – 53.87
Soybeans	44.33 – 49.97	42.21 – 47.89	37.54 – 43.57	38.20 – 40.70
Oats	40.40 – 44.37	38.64 – 44.03	36.86 – 42.40	35.50 – 39.20
	Size of Farm in Rotated Crop Acres			
	88 – 199	200 – 299		300 – 560
Wheat	44.84 – 51.19	43.35 – 49.83		41.60 – 46.41
	Number of Cuttings			
	One	Two		Three
Hay	33.90 – 37.95	44.51 – 53.10		53.47 – 59.14

Appendix Table E.–Size of Machinery Used to Produce Crops on Different Size Farms in Northwestern Ohio in 1959

Machine	Size of Farm in Crop Acres			
	63 – 149 Average 110	150 – 249 Average 196	250 – 349 Average 298	350 – 650 Average 440
Plow – bottoms	2.6	2.9	3.2	3.2
Disk – feet	7.9	8.4	9.6	12.0
Corn planter – rows	2.6	3.2	3.9	4.0
Cultivator – rows	2.2	2.7	3.6	3.8
Corn picker – rows	1.5	1.7	1.9	2.0
Grain drill – disks	13	14	15	16
Combine – feet	6.6	6.9	8.0	10.3

Appendix Table F.–Relationship Between Size of Field and Amount of Time Required to do Certain Jobs in Northwestern Ohio 1959

Job	Number of Cases	Acres in Field		Man Hours Used per Acre	Difference in Amount of Time Used	t Value
		Range	Average			
Plow – 3-14" plows	25	9-15	12	.88		
Plow – 3-14" plows	23	25-47	31	.89	.01	.24
Plant corn – 4 rows	31	8-15	13	.31		
Plant corn – 4 rows	26	26-50	35	.25	.06	3.43**
Cultivate corn – 4 rows	23	10-18	15	.32		
Cultivate corn – 4 rows	20	28-50	35	.25	.07	2.71*
Pick corn – 2 rows	25	7-15	12	.96		
Pick corn – 2 rows	24	25-50	34	.94	.02	.32
Mow hay – 7' mower	26	3-10	9	.47		
Mow hay – 7' mower	13	20-49	23	.42	.05	1.05

*Significant at .05 level.

**Significant at .01 level.